"THE EFFECT OF BODY WEIGHT SUPPORTED TREADMILL TRAINING (BWSTT) ON SENSORIMOTOR FUNCTION, BALANCE AND GAIT AMONG PATIENTS WITH ACUTE MIDDLE CEREBRAL ARTERY STROKE"

- A QUASI EXPERIMENTAL STUDY

Dissertation submitted to The Tamil Nadu Dr. M.G.R. Medical University towards partial fulfilment of the requirements of **MASTER OF PHYSIOTHERAPY (Advanced PT in Neurology)** Degree programme.

KMCH COLLEGE OF PHYSIOTHERAPY

(A unit of Kovai Medical Center Research and Educational Trust)

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2017 - 2019

CERTIFICATE

This is to certify that the dissertation entitled "**THE EFFECT OF BODY WEIGHT SUPPORTED TREADMILL TRAINING (BWSTT) ON SENSORIMOTOR FUNCTION, BALANCE AND GAIT AMONG PATIENTS WITH ACUTE MIDDLE CEREBRAL ARTERY STROKE – A QUASI EXPERIMENTAL STUDY"** is a bonafide work done by **NANTHINI. P** bearing the **Register No: 271720084,** KMCH College of Physiotherapy, towards partial fulfilment of the requirements of the **Master of Physiotherapy (Advanced PT in Neurology**) of The Tamil Nadu Dr. M.G.R Medical University, Chennai - 32

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ACKNOWLEDGEMENT

ACKNOWLEDGEMENT

*First and foremost, I thank **god** for showering me with his divine blessings, enriched love and matchless grace, which gave me inner strength and guidance that carried me throughout my study.*

*I deeply thank **my beloved parents** for unconditional love, sincere prayers, unstinted support and care without which I would not have accomplished anything.*

*My warm hearted thanks to KMCH management, especially the chairman **Dr.Nalla G. Palaniswamy MD (AB)**, and the trustee **Dr Thavamani D. Palaniswamy MD (AB)F.A.A.B**,for the wide variety of opportunities.*

*I am delighted to express my profound thanks to our respected principal, **Dr. Edmund Mark D' Couto, M.D, Phys. Med and Rehab**, KMCH college of physiotherapy, for being a pillar of encouragement and also providing us with all necessary infrastructure and other facilities.*

*I thank **Dr. O.T Bhuvaneswaran, Phd**, chief executive officer, for his role in the academic front.*

*I express my sincere gratitude to **Mrs.A.P.Kalpana MPT(Cardio)**, Vice principal KMCH college of physiotherapy for her constant support and motivation.*

*I owe my sincere gratitude to my project guide **Mrs. A. BRAMMATHA, MPT (Neuro),** Professor, KMCH College of Physiotherapy, For her remarkable support, guidance, valuable suggestions, patience and motivation throughout study.*

*I express my heartiest thanks in this instance to, **Mr S. Sivakumar, MPT(Ortho)** , **Mr. David V Samuel, MPT(Ortho), Mr J. Prakash, MPT(Ortho), Mr. R. Selvaeswaran, MPT (Neuro), Miss. Shanmughapriya, MPT(cardio), Mr .T. Karthikeyan, MPT(Neuro)** for their valuable suggestions support and encouragement.*

*I extend my grattitude to **Mr.K. Venugopal, MA, Mphil**, professor, Research and statistics for guiding me with the necessary tool to analyse my study without which it was impossible to draw the inference.*

*I thank the librarians of this institute, **Mr.P.Dhamodaran** and **Mr.Sivasamy** and his fellow members for their cooperation. I sincerely acknowledge my best friends, batch mates, my seniors, and all my well wishers who were always there to guide and render their support to me throughout my project.*

I also extend my thanks to all the patients for their willingness and co-operation in the study.

*And last but obviously the most I would like to express my heartly thanks to **my beloved classmates and friends** for their active participation and cooperation without which this study would not have progressed to be successful.*

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ABSTRACT

ABSTRACT

Background: **S**troke is defined as the immediate loss of neurological function caused by an interruption of the blood flow to the brain or the rupture of blood vessels in the brain. Hemiparesis is the most frequent neurological deficit presenting with Balance and Gait deficits, which in turn leads to disability among the acute period of post stroke individuals. Locomotor Training, including the use of Body Weight Supported Treadmill Training, is a physical therapy Intervention used to improve recovery of the ability to walk after stroke.

Aim & Objective: To Determine the Effect of Body Weight Supported Treadmill Training (BWSTT) improve Sensorimotor Function(LE), Balance and Gait among patients with Acute Middle Cerebral Artery Stroke.

Methodology &Procedure: Quasi-experimental research design with purposive sampling technique was employed. Sixteen patients undergoing treatment for MCA territory stroke hemiparesis in Kovai Medical Centre and Hospital, Coimbatore, with age group 30 – 75 years were selected. Sixteen (16) patients were randomly allocated into each group. Group A received Conventional Exercise and Group B received Body Weight Supported Treadmill Training (BWSTT) along with Conventional Exercise. Treatment Duration is 5 times/week for totally 3 weeks.

Outcome Measures : Fugl- meyer Sensorimotor assessment of Physical Performance (FMA- LE) for assessing the Motor Function, Berg Balance Scale(BBS) for assessing the Balance, Functional Ambulation Category(FAC) for assessing the Ambulation, Activities Specific Balance Confidence Scale(ABC) for assessing the Confidence Level, Gait Parameters include Step Length, Stride Length, Cadence.

Results: The Data was analyzed by using Paired‘t’ test and Independent‘t’ test. The Group that received Body Weight Supported Treadmill Training had significant improvement in all certain variables except for Berg Balance Scale (BBS), Functional Ambulation Category (FAC), Step Length, and Stride Length.

Conclusion: The result of this study provide shows that, the Body Weight Supported Treadmill Training (BWSTT) could be used for early rehabilitation after stroke to

help in recovery, and improves the Sensorimotor Function, Confidence Level and Spatiotemporal parameters (Cadence) among patients with Acute Middle Cerebral Artery Stroke.

KEYWORDS: MCA stroke hemiparesis, Body Weight Supported Treadmill Training, Balance, Gait.

INTRODUCTION

INTRODUCTION

The world health organization had used standard criteria in (2015) to define stroke as "a clinical syndrome consisting of rapidly developing clinical signs of focal (or global in case of coma) disturbance of cerebral function lasting more than 24 hours or leading to death, with no apparent cause other than vascular origin"[(1)]

In 2017, the Incidence and Prevalence of Stroke in India ranged from 105 to 152/100,000 persons per year and crude prevalence of stroke ranged from 44.29 to 559/100,000 persons in different parts of these country during past decade [(2)]

The change in life style and food habits among people made it common disabling disease in India. Residual moor weakness, Abnormal Movement Synergies, and Spasticity result in altered Gait pattern and contribute to poor balance, risk of fall, and increased energy expenditure during walking[(3)]

Gait Impairment after Stroke is common, with many stroke survivors living with Residual Gait Problems, despite extensive Rehabilitation [(4)]

Some of the abnormal gait after stroke that have been identified include reduced stride and step length, wide base of support as well as increased stance periods and altered swing phase periods[(4)]

Gait Performance is an indicator of mobility impairment and disability after stroke. It predicts mortality, morbidity, and risk of future stroke. The control of gait involves the planning and execution from the multiple cortical areas, such as secondary and pre motor cortex. Stroke patients often have gait impairment such as decreased gait speed and asymmetrical gait cycle as a result of cortical reorganization. Repetitive mass motor task practice had been shown to facilitate neuro plasticity and brain reorganization in stroke patients, resulting in enhanced motor recovery after stroke[(5)]

Early Intervention with physical therapy to restore walking after stroke was recommended to improve motor function and decrease disability [(5)]

Locomotor training including the use of Body Weight Supported Treadmill Training is a physical therapy intervention, used to improve recovery of ability to work after stroke[(6)]

Locomotor Training is an Advancing Intervention for recovery of function after neurologic injury (or) disease. The two immediate impairments of most significance to gait performance are diminished strength or inability to generate voluntary muscle contraction of normal magnitude in any muscle group and inappropriately muscle graded activity. Reduced

walking speed and longer stance phases have been observed for both affected and unaffected lower limbs. Typically, the stance phase is longer than in duration and occupies a greater proportion of gait cycle on unaffected side, compared to the affected side. Before starting the locomotor training, stroke patients should have,

- Strength,
- Sit to Stand Transfer,
- Standing Balance.

In Physical Rehabilitation – Susan B.O' Sullivan (Published year – 2014).The Major Requirements of successful walking includes the following:

- Support of body mass by Lower Extremity's
- Production of locomotor rhythm
- Dynamic postural control of the moving body
- Propulsion of the body in the intended direction
- Adaptability of locomotor response to changing environmental and task demands[7]

Treadmill Training with Body Weight Support not only needs to be effective, but it also needs to be shown not to be deleterious in terms of Quality of life.[8]

Treadmill Training will improve the confidence level to walk, participate in the community may be enhanced [8]

Body Weight Supported Treadmill Training (BWSTT) is a Task – Oriented Technique or Gait Restoration after stroke. Body Weight Supported Treadmill Training has the advantage over conventional therapy as it offers higher intensity, more repetitive and task- oriented practice over the same period of time when compared to conventional therapy. Body Weight Supported Treadmill Training induces changes in corticomotor excitability which leads to improved Balance and Gait performance with stroke [9]

The Treadmill stimulates repetitive and rhythmic stepping with the patient supported in an upright position and bearing weight on the lower limb [10]

Improving walking after stroke is one of the main goals of rehabilitation. There is increasing evidence that high-intensity, repetitive, task-specific training might result in better gait Rehabilitation. Walking on a treadmill, with or without body weight supported via a harness connected to an overhead support system, is a method of treating walking impairments post stroke that is becoming popular [10]

NEURO-PHYSIOLOGY

Locomotion is Rhythmic motor activity generated by Spinal Neural Networks called "Central Pattern Generators (CPG)". CPG's are neuronal networks that generate the rhythm for walking and shape the pattern of the motor bursts of motor neurons in the leg muscles [11]

These spinal networks are activated, modulated and stopped by supraspinal structures for initiation and adaptive control of goal directed locomotion. CPG's can produce self – sustained patterns of behaviour independent of sensory behavior. However, Sensory feedback is an integral part of the overall motor control system and is critical in modifying CPG – generated more programs in order to facilitate constant adaptations to the environment[12]

To Encourage experience dependent plasticity in the Central Nervous System, Body Weight Supported Treadmill Training ought to be built on principles of "MOTOR LEARNING" and performed at speed, lower extremity loads, and with limb kinematics that optimizes inputs that the spinal and supraspinal locomotor networks can interpret as normal walking inputs[13]

1.1 OPERATIONAL DEFINITION:

Middle Cerebral Artery (MCA) Stroke

` Middle Cerebral Artery (MCA) Stroke is defined as the sudden onset of focal neurologic deficit resulting from Brain Infarction (or) Ischemia in the territory supplied by the MCA. The MCA is by far the largest cerebral artery and this vessel is commonly affected by Cerebrovascular Accident. The MCA Supplies most of the outer cortex brain surface, nearly all the basal ganglia, posterior and anterior internal Capsules. Infarcts that occur within the vast distribution of this vessel lead to diverge neurological sequelae.

Body Weight Supported Treadmill Training (BWSTT)

Body Weight Supported Treadmill Training "uses overhead suspension system an harness to support a percentage of the patient's body weight as the patient walks on a treadmill", thereby removing weight symmetrically from the lower extremities

1.2 NEED FOR THE STUDY

Hemi paresis is the most frequent neurological deficit, presenting with Balance and Gait deficits, which in turn leads to disability among post stroke individuals. Rapid and optimal improvement of Balance, Gait and Postural Control among patients with stroke is essential for their early Functional Independence and Social Participation [(14)]

Rehabilitation initiated as early as possible has found to have a Better Prognosis. The Rate of Improvement tapers off with time till about 6 months. Rehabilitation initiated after 5 days of the occurrence of stroke has proved to have a better outcome than others [(14)]

Improving Walking after stroke is one of the main goals of rehabilitation. Body weight supported treadmill training is a Physical Therapy Intervention used to improve the ability to walk after stroke. It is being supported and expanded by various literatures. The Technological advancements in treadmill training will help them in early recovery

Treadmill Training is task – oriented practice and this also 'increase the motivation, confidence level and active participation for the treatment'

In the Current of Level Of Evidence studies have shown that Body weight supported treadmill training could produce mixed results - "Treadmill Training with Body Weight Support for walking after Stroke [Cochrane Database Syst Rev 2017] – they concluded that, most of the people after stroke who are able to walk at the beginning of therapy (Treadmill Training) appear to be benefit most from this type of intervention, but people who are not able to walk independently at therapy (Treadmill Training) do not get benefit from this type of intervention. And the Quality of evidence for Treadmill Training after stroke was 'low to moderate'.

Treadmill Training uses the concept of 'Motor Learning'. In this Treadmill Training, Feedback is an essential aspect of gait training by using visual inputs, haptic feedback to keep the training program engaging and challenging. So, the treadmill training provides a safe, effective and motivating environment for the patients

Since the advent of better medical facilities and early rehabilitation , the trend has changed towards shorter hospital stay and early discharge. It is important to start the gait immediately after the patient is medically stable so as to improve the functional recovery

So, this study is intended to, Identify the Feasibility and to Find out the Effectiveness of Treadmill Training.

REVIEW OF LITERATURE

2. REVIEW OF LITERATURE

2.1 STUDY ON BODY WEIGHT SUPPORTED TREADMILL TRAINING

2.1.1 Mehrholz J,Pohl M, et al., (Cochrane Database Syst Rev, 2014)

- "Treadmill Training and Body Weight Support for Walking after Stroke (Review) – Systemic Review" which includes 44 trials with 2658 participants in this updated review. Over all, the use of treadmill training with Body Weight Support did not increase the chances of walking independent compared with other physiotherapy intervention (Risk Difference RD – 0.00, 95 % confidence level (CI0 -0.02 to 0.02 ; P = 0.94; I^2 =60%). Overall, the use of treadmill training with body weight support in walking rehabilitation for patients after stroke increased walking velocity and walking endurance significantly. The Pooled MD (random-effects model) for walking velocity was 0.04m/s (95% CI -0.06% to 0.14; P= 0.04; I^2 = 40%)and the Pooled MD for walking endurance lasted until the end of scheduled follow up (MD 58.88 meters, 95% CI 29.10 to 88.66; P = 0.0001; I^2 = 0) and concluded as Overall, people after Stroke who receive treadmill training with or without body weight support are not more likely to improve their ability to walk independently compared with people after stroke not receiving treadmill training, but walking speed and walking endurance may improve. Specifically, Stroke patients who are able to walk (but not people who are not able to walk) appear to benefit most of this type of intervention. This review found that improvements in walking endurance in people able to walk may have persisting beneficial effects. Further research should specifically investigate the effects of different frequencies, durations or intensities of treadmill training, as well as the use of handrails, in ambulatory patients, but not in dependent walkers.

2.1.2 Gillian D Baer et al., (2017)

- " Treadmill Training to improve mobility for people with Sub-acute stroke : A Phase II Feasibility – Randomized Controlled Trail " which includes 77 patients, in that 39 patients are experiment group and 38 patients are control group and the primary outcome measures was the Rivermead Mobility Index and other measures included the Functional Ambulation Category, 10-meter walk, 6-minute walk, Barthel Index,

Motor Assessment Scale, Stroke Impact Scale and measure of confidence in walking and the results was feasible to deliver treadmill training to people with sub acute stroke and concluded as Treadmill Training in sub- acute Stroke patients was feasible.

2.1.3 Muhammad Asad ullah et al., (2017)

- " The Effect of Gait Training with Body Weight Support (BWS) with no Body Weight Support (no – BWS) in Stroke patients – Randomized Controlled Trail" which includes 80 patients, in that 40 patients are experiment group and 40 patients are control group, and the outcome measure included is Timed 10 Meter Walk Test, Timed Up and Go Test and Dynamic Gait Index and resulted in better walking abilities than the training of gait while full weight was placed on patients lower extremities and concluded as this research suggested that improvements in gait achieved during supported locomotion can be continued and trains to full weight body over ground waling after a training procedure. Ultimately this will be more useful with better balance and gait over ground walking speed. One of the major advantages of the use of BWS, is to provide the task specific gait training during early days of rehabilitation as needed by the patients. This can recompense for their inability to presume an upright position while stepping forward.

2.1.4 Pamela W. Duncan, P.T.,et al., (2011)

- " Body Weight Supported Treadmill Rehabilitation after Stroke - Randomized Controlled Trail" which includes 408 participants ,all participants are randomly assigned them to one to three training groups. Each intervention included 36 sessions and the primary outcome measures are Fugl Meyer Assessment of Motor Recovery in the legs, Berg Balance Scale, Activities Specific Balance Confidence Scale, and the Activities of Daily Living – Instrumental Activities of Daily Living (ADL – IADL) Scale and this study concluded as Locomotor Training, included the use of body weight support in stepping on a treadmill, was not shown to be superior to progressive exercise at home managed by a physical therapist and hypothesized that early locomotor training would improve waling speed more than late locomotor training because prior studies suggested that the degree of recovery occurs early and is complete by 6 months.

2.1.5 Catherine M Dean et al., (2010)

- " Treadmill Training with Body weight Support in sub acute non – ambulatory stroke improves walking capacity more than over ground walking : A Randomized Controlled trail" which includes 126 patients and the primary outcome measures used were 10 meter walk test, 6 minute walk test and other measures are walking quality and capacity, walking perception, community participation and falls and this study concluded that treadmill training with body weight support results in better walking capacity and perception of walking compared to over ground walking without deleterious effects on walking quality.

2.1.6 Inacio Teixeira Da cunha et al., (2002)

- "Gait Outcomes After Acute Stroke Rehabilitation with Supported Treadmill Ambulation Training : a Randomized Controlled Pilot Study" which include 15 Acute Stroke participants, in that 7 participants assigned to reular intervention and 6 participants assigned to treadmill training and the outcome measures was Functional Ambulation Category, Gait Speed, Walking Distance, Gait Energy Expenditure and Gait Energy Cost and this study suggested that the small sample size did not generate enough power to detect significant differences in any variable. However, medium to large effect sizes of 0.7 and 1.16 standard deviation units are observed for gait energy cost and walk distance respectively and concluded as this pilot study indicated that Treadmill Training is a safe, feasible, and promising intervention for acute stroke survivors. A larger trial is warranted for statistical relevance.

2.1.7 Mehrholz J et.al ., (2017)

- "Treadmill Training and Body Weight Support for Walking after Stroke" – A Randomized Controlled Trail " which includes 56 trials with 3105 participants in this updated review (2017) and 26 studies – 1410 participants compared the Treadmill Training with Body Weight Support to another physiotherapy treatment ; 2 studies – 100 participants compared Treadmill Training with Body Weight Support to Treadmill Training without Body Weight Support ; 4 studies – 147 participants did not state whether they used Body Weight Supported or not and concluded that overall people after stroke who receive treadmill training, with or without body weight support, are not more likely to improve their ability to walk independently compared

with people after stroke not receiving Treadmill Training, but walking speed and walking endurance may improve slightly in the short term. Specifically, people with stroke who are able to walk (but not people who are dependent in walking at start of treatment) appear to benefit most from this type of intervention with regard to walking speed and walking endurance. This review did not find, however, that improvements in walking speed and endurance may have persisting beneficial defects. Further research should specifically investigate the effects of different frequencies, duration, or intensities (in terms of speed increments and inclination) of treadmill training, as well as the use of handrails, in ambulatory participants, but not in dependent walkers.

2.1.8 Yu – Rang Mao et.al., (2015)

- "The Effect of Body Weight Support Treadmill Training on Gait Recovery, Proximal Lower Limb Motor Pattern, and Balance in patients with Sub acute Stroke" which includes 24 sub acute stroke patients and divided into 12 participants in experiment group (BWSTT) and 12 participants (conventional therapy)outcome measures were Brunel Balance Assessment and Fugl Meyer Assessment Scale and result in both groups improved on balance and lower extremity motor function and concluded that, Sub acute patients with stroke, BWSTT can lead to improved gait quality when compared with conventional gait training. Both methods can improve balance and motor function.

2.1.9 Karen J.McCain et al.,(2007)

- " Locomotor Treadmill Training with Body Weight Support Prior to Over – Ground Gait : Promoting Symmetrical Gait in a Subject with Acute Stroke – Case Study", 60-year old male with a large right-sided infarct extending into the basal ganglia. Locomotor training with BWS began on day 10 following the infarct. The subject had 5 sessions, totally 40 minutes of walking practice, prior to starting gait training over ground and this case report results in the subject walked with the single point cane(contact guard to stand by assistance) for a total of 1000 feet at a speed of 0.94m/s (185 ft/min) with discharge on day 25 of rehabilitation. He demonstrated comparable stance time and step length bilaterally and concluded as that the subject of this case report experienced a good outcome using a combination of early locomotor treadmill training and traditional therapeutic activities. Further

investigation of early treadmill training may be warranted in subjects with Acute Stroke.

2.2 STUDY ON FUGL MEGER ASSESSMENT OF PHYSICAL PERFORMANCE (FMA – LE)

2.2.1 Heesoo Kim et.al.,(2012)

- "Reliability, concurrent validity and Responsiveness of the Fugl Meyer Assessment for Hemiplegic Patient' which included 50 patients and 2 physical therapist and 1 occupational therapist rated 50 video recordings of hemiplegic patients using Fugl Meyer Assessment to test Inter rater reliability and 1 physical therapist rated each of 50 video clips on two occasions, 2 weeks apart, to evaluate the test-retest reliability. Concurrent Validity was examined using Person's correlation co-efficient and concluded that results indicate that the Fugl Meyer Assessment is a Reasonable Assessment of the function of upper and lower extremities of patient with stroke.

2.2.2 Katherine J Sullivan et.al., (2011)

- "Fugl Meyer Assessment of Sensoimotor Function after Stroke – Standarized Training Procedure for Clinical Practice and Clinical Trials" which includes 50 individuals with hemi paretic Stroke, 17 trained Physical Therapist across 5- regional clinical sites and an expert rater participants in an Inter Rater Reliability study of the Fugl Meyer-Motor (Total upper extremity and lower extremity subscores) and Sensory (total light touch, Proprioception subscores) assessments and concluded that it is High Inter-rare Reliability for the Fugl Meyer Motor and Sensory Assessment.

2.3 STUDY ON BERG BALANCE SCALE (BBS)

2.3.1 C.A.Lima et al.,(2018)

- "The Berg Balance Scale as a clinical screening tool to predict fall risk in older adults : a systematic review", the main objective of this study is to verify whether the BBS can predict falls in older adults and this study reported a difference in the BBS score between fallers and non-fallers. Studies presented low to moderate risk of bias and finally concluded as the evidence to support the use of BBS to predict falls is

insufficient, and should not be used alone to determine the risk of falling in older adults.

2.3.2 Stephin Downs et.al., (2013)

- "The Berg Balance Scale has High Intra and Inter-Rater Reliability but absolute Reliability varies across the Scale"- A Systemic Review, which includes any clinical population that has undergone assessment with berg balance scale and 11 studies involving 668 participants were included in the review and outcome measures are relative inter-rater reliability, relative inter-rater reliability and absolute reliability ad concluded that the berg balance scale has accepatable reliability.

2.3.3 Lisa Blum et al.,(2008)

- "Usefulness of the Berg Balance Scale in Stroke Rehabilitation : A Systematic Review", the main objective of this study is to identify psychometric properties, strengths and weaknesses in its usefulness for stroke rehabilitation and concluded as it is an effective and appropriate assessment of balance in patients with stroke.

2.4 STUDY ON FUNCTIONAL AMBULATION CATEGORY (FAC)

2.4.1 Chang Sik Park et.al., (2016)

- "Reliability and Validity of the Modified Ambulation Category Scales in patients with hemi paralysis" which includes 66 stroke patients with hemi paralysis. Inter and intra-rater validity of the mFAC was calculated using the spearman's correlation co-efficient and concluded that mFAC has sufficient inter and intra reliability and high validity, it can be used as an assessment tool that reflects the gait performance and mobility of stroke patients.

2.4.2 J Mehrholz et al.,(2007)

- "Predictive validity and responsiveness of the Functional Ambulation Category in hemi paretic patients after stroke – Prospective Cohort" , the main objective of this study is to determine the validity, and responsiveness, which includes 55 patients and concluded as FAC has excellent reliability, good concurrent ad predictive validity, an good responsiveness in patients with hemi paresis after stroke.

2.5 STUDY ON ACTIVITIES SPECIFIC BALANCE CONFIDENCE (ABC) SCALE

2.5.1 Jamal Ali moiz et.al., (2017)

- "Activities specific balance confidence scale for predicting future falls in Indian older adults- a prospective cohort study" which includes 125 community dwelling older adults. The Occurrence of falls over the follow up period of 12 months was recorded. Discriminative validity was analysed by comparing the total ABC-H scale between the faller and non-faller groups and concluded that the ABC-H scores were significantly and independently rated with future falls in the community dwelling Indian older adults. The ability of the ABC-H scale to predict future falls was adequate with high sensitivity and specifically values.

2.5.2 Kritine M.C et al.,(2008)

- " Psychmetric properties of the Activity Specific Balance Confidence Scale and the Survey of Activities and Fear of fall in older women" the main objective I to compare the psychometric properties of the ABC and the Activities and Fear of Falling in the Elderly (SAFE) and the results is ABC had stronger baseline correlations than the SAFE with most measures, and concluded as this instrument is sensitive to measuring lower levels of fear of falling are needed to capture the full range of this phenomenon in this population.

AIMS AND OBJECTIVES

3. AIM & OBJECTIVES

3.1 AIM

- To find out the Effect of Body Weight Supported Treadmill Training (BWSTT) on Sensorimotor Function, Balance and Gait among patients with Acute Middle Cerebral Artery Stroke.

3.2 OBJECTIVES

- To Study the Effect of Body Weight Supported Treadmill Training (BWSTT) on sensorimotor function by Using Fugl Meyer Assessment – lower extremity (FMA-LE) among Patients with Acute Middle Cerebral Artery Stroke.
- To Study the Effect of Body Weight Supported Treadmill Training (BWSTT) on Balance by Using Berg Balance Scale among Patients with Acute Middle Cerebral Artery Stroke.
- To Study the Effect of Body Weight Supported Treadmill Training (BWSTT) on Functional Ambulation by Using Functional Ambulation Category among Patients with Acute Middle Cerebral Artery Stroke.
- To Study the Effect of Body Weight Supported Treadmill Training (BWSTT) on Balance Confidence by Using Activities Specific Balance Confidence (ABC) Scale among Patients with Acute Middle Cerebral Artery Stroke.
- To Study the Effect of Body Weight Supported Treadmill Training (BWSTT) on Gait (Step Length, Stride Length, Cadence) in patients with Acute Middle Cerebral Artery Stroke.

METHODOLOGY

4. MATERIALS AND METHODOLOGY

4.1 RESEARCH DESIGN

- Quasi – Experimental Design.

4.2 STUDY POPULATION

- MCA Stroke population.

4.3 SAMPLING TECHNIQUE

- Purposive Sampling Technique.

4.4 SAMPLE SIZE

- 16 MCA Stroke Patients
- Group A – Control Group (8)
- Group B – Experiment Group (8)

4.5 STUDY SETTING

- Department of Physical Medicine and Rehabilitation,
- Kovai Medical Center and Hospital, Coimbatore.

4.6 CRITERIA FOR SELECTION

- Patients who are diagnosed to have MCA Stroke fulfilling the following inclusion and exclusion criteria will be selected for the study.

4.6.1 INCLUSION CRITERIA

- Clinically diagnosed as first acute MCA Stroke (confirmed by CT or MRI Scan) – ischemic stroke
- Both Right and Left Acute Stroke patients (1 to 7 days)
- Both Males and Females.
- Aged between 30 to 75 years of age.
- Ability to walk 3 Meter (approximately 10 feet) with assistance from not more than one person.
- Ability to follow three step commands.
- Patients with good cognition (MMSE >24)
- Medically stable patients to allow participation with testing protocol and intervention.

4.6.2 EXCLUSION CRITERIA

- Pre-existing other neurologic disorders like Parkinsons disease, Multiple Sclerosis, Amyotrophic Lateral Sclerosis.
- History of Congestive Heart Failure, cardiac arrhythmias, hypertrophic cardiomyopathy, heart surgery within 3 months.
- History of serious chronic obstructive pulmonary disease (or) oxygen dependence.
- History of musculoskeletal / orthopaedic conditions like OA, RA, Gout Arthritis (during the period of treatment).
- Severe Pain during weight bearing (due to any other cause).
- Body weight over 110kg, because the harnesses would not fit individuals over this body weight.
- Perceptual or cognitive deficits which can interfere in gait training. Eg. Pusher's syndrome.

4.7 HYPOTHESIS

4.7.1 NULL HYPOTHESIS

- Ho1 - There is no significant change in Lower Limb Sensorimotor function measured using Fugl Meyer Assessment of Physical Performance – Lower extremity (FMA-LE) following the Body Weight Supported Treadmill Training in patients with Acute Middle Cerebral Artery Stroke.
- Ho2 – There is no significant change in Functional Balance measured using Berg Balance Scale following the Body Weight Supported Treadmill Training in patients with Acute Middle Cerebral Artery Stroke.
- Ho3 - There is no significant change in Functional Ambulation measured using Functional Ambulation Category following the Body Weight Supported Treadmill Training in patients with Acute Middle Cerebral Artery Stroke.
- Ho4 – There is no significant change in Balance Confidence measured using the Activities Specific Balance Confidence (ABC) Scale following the Body Weight Supported Treadmill Training in patients with Acute Middle Cerebral Artery Stroke.

4.7.2 ALTERNATE HYPOTHESIS

- Ho1 - There is a significant change in Lower Limb Sensorimotor function measured using Fugl Meyer Assessment of Physical Performance – Lower extremity (FMA-LE) following the Body Weight Supported Treadmill Training in patients with Acute Middle Cerebral Artery Stroke.
- Ho2 – There is a significant change in Functional Balance measured using Berg Balance Scale following the Body Weight Supported Treadmill Training in patients with Acute Middle Cerebral Artery Stroke.
- Ho3 - There is a significant change in Functional Ambulation measured using Functional Ambulation Category following the Body Weight Supported Treadmill Training in patients with Acute Middle Cerebral Artery Stroke.
- Ho4 – There is a significant change in Balance Confidence measured using the Activities Specific Balance Confidence (ABC) Scale following the Body Weight Supported Treadmill Training in patients with Acute Middle Cerebral Artery Stroke.

4.8 MEASUREMENT TOOLS

- Fugl – Meyer Sensorimotor Assessment of Physical Performance (FMA-LE)
- Berg Balance Scale (BBS)
- Functional Ambulation Classification (FAC)
- The Activities- Specific Balance Confidence (ABC) Scale
- Selected variables of Gait ;
  - Cadence
  - Step length
  - Gait Speed

4.9 MATERIALS USED

- Universal Gonimeter
- Inch Tape
- Knee Hammer
- Assessment Form
- Stop Watch

4.10 TREATMENT DURATION

- Continuous Body Weight Supported Treadmill Training along with conventional exercise for Experiment Group, Conventional Exercise for Control Group - 5 times/week – 1 hour
- Totally 3 weeks
- Totally 15 session

4.11 PROCEDURE

Inpatients of Kovai Medical Centre and Hospital undergoing treatment for MCA territory stroke hemi paresis were selected for the study. Patients were recruited on their first visit to Physiotherapy after them being certified medically stable by their consulting physicians. This study was started with daily screening of all MCA Territory stroke hemi paresis inpatients and out-patients of Physical Medicine and Rehabilitation, Kovai Medical Centre and Hospital. Power and Sample size calculation was done. And Got Ethical Approval from Kovai Medical Centre and Hospital. Patients who fulfilled the inclusion criteria and showed willingness to participate in the study and gave the Informed Consent were selected for the study.

Pre test measures on Fugl- Meyer Sensorimotor assessment of Physical Performance , Berg Balance Scale, Functional Ambulation Category, Activities Specific Balance Confidence Scale, Gait Parameters (step length, stride length, cadence) scores were taken prior to Physiotherapy intervention. Patients were then randomly allocated into GROUP A (Control Group) and GROUP B (Experiment Group)

Experimental group received Continuous Body Weight Supported Treadmill Training along with Conventional Exercise given for 5 days – 1 Hour. Control group received Conventional Exercises for 5 days – 1 Hour

Post test measures on Fugl- Meyer Sensorimotor assessment of Physical Performance, Berg balance scale, Functional Ambulation Category, Activities Specific Balance Confidence Scale, Gait Parameters (step length, stride length, cadence) scores were taken on the last day (i.e., 5^{th} day)

4.12. INTERVENTION

CONTROL GROUP

The Patients in Control Group receive Conventional Therapy.

- Diaphragmatic Breathing Exercises.
- Range of Motion Exercises (by Passive and Active assisted)
  - {Then progressed to Active Range Of Motion Exercise}
- Stretching Exercises given to Upper and lower limb - hold it for 10 seconds
- Pelvic Bridging –hold it for 10 to 15 seconds
  - {Initially starts with bilateral and then progressed to unilateral}
- Resisted Exercise by using weight cuffs
- Mat Activities training
  - Supine to side lying
  - Side lying to prone
  - Prone on elbows
  - Prone on hands
  - Quadripod Position
- Sit to Stand training (initially with assistance, then progressed to without assistance)
- Parallel Bar Training (by mirror)
  - Side walking
  - Forward walking
  - Tandem walking
  - Backward walking
  - (Initially Start with 8 – 10 repetition then progressed to 15 – 20 repetition)
- Balance exercise
- Functional reaching in all direction
- Single limb stance
- Co-ordination exercise
  - Balloon Tossing
  - Juggling
  - Frenkel exercise.
- After getting Discharge from the hospital, the home program was taught as per stroke rehabilitation unit guideline by KMCH Hospitals. At the time of discharge, post test measures had taken.

EXPERIMENTAL GROUP

Locomotor Training using Body weight supported Treadmill Training (BWSTT)

- Body Weight Supported Treadmill Training is a training device for Simultaneous control of unweighting, posture and balance on a treadmill or firm surface. Systems providing Dynamic unweighting are a perfect solution for training patients in a wide range of gait disorders.
- It helps to maintain proper posture, reduces load, eliminates balance problems and improves motor co-ordination training.
- Unique Harness are designed for the uni or bilateral support of the body as well as gradual level change from fully loaded to fully unloaded.
- Locomotor Training using Body Weight Supported Treadmill Training allows the therapist to access the Trunk, Pelvis, and Lower Extremities to manually assist, guide, limb placement, weight shifts and stepping symmetry.
- The Therapist provides manual resistance to Foot placement during stepping movement of weaker lower extremity and other person will stand behind the patient.
- The Harness controls the upright position of the patient in the absence of good postural stability and reduces the fear of falling. The Harness is suspended from a metal frame (or) from the ceiling.
- The Harness and Body Weight Treadmill provide the support and reduce the weight on your feet while walk on the treadmill. The Amount of support can be gradually increased (depends on the patients need).

4.13 PHOTOGRAPHIC ILLUSTRATION

FIGURE:4.13.1 - BODY WEIGHT SUPPORTED TREADMILL TRAINING (BWSTT)

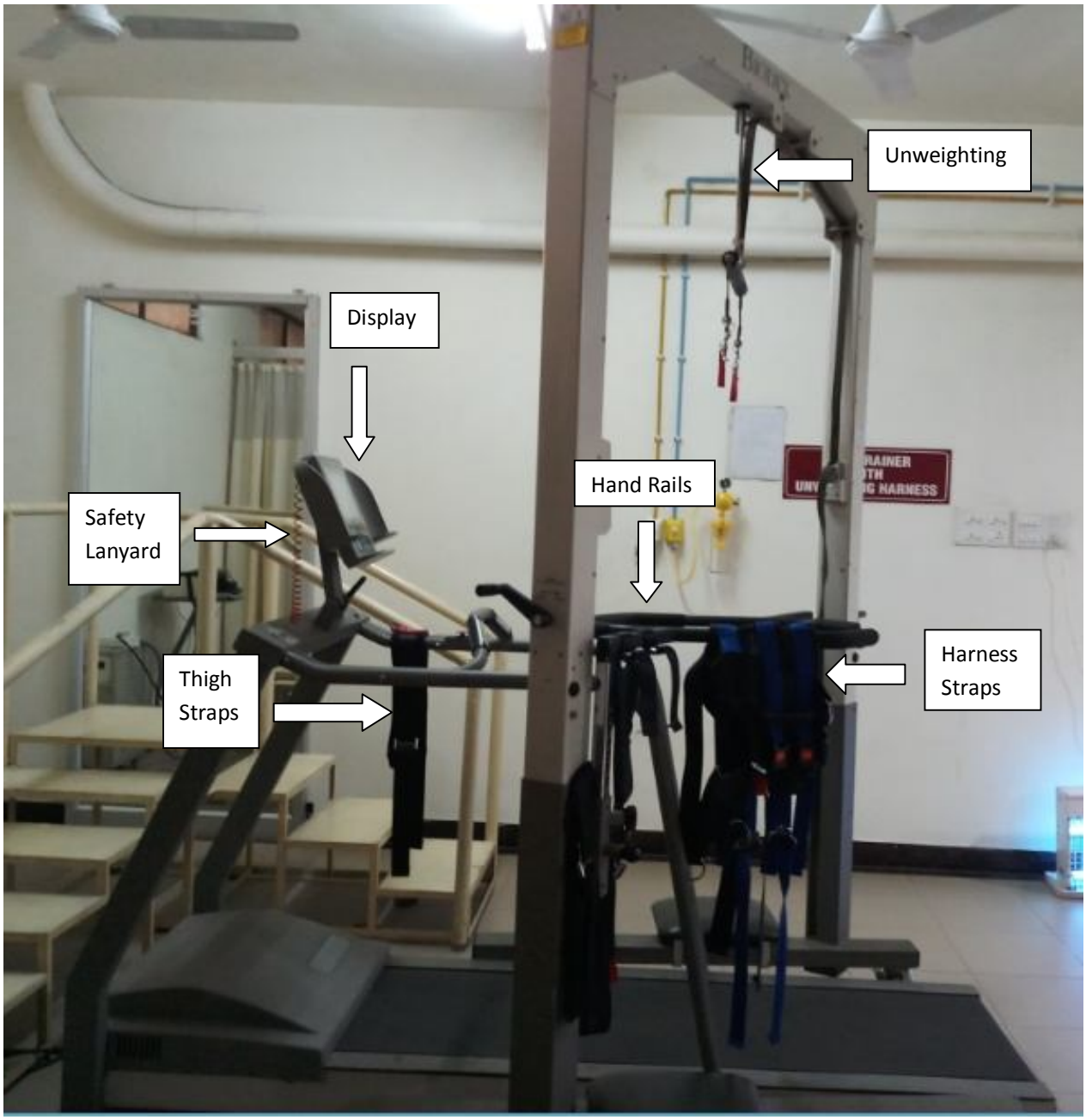


FIGURE: 4.13.2

GAIT TRAINING MODE

FIGURE: 4.13.3

GAIT TRAINING SETUP INFORMATION

FIGURE: 4.13.4

EXERCISE RESULTS

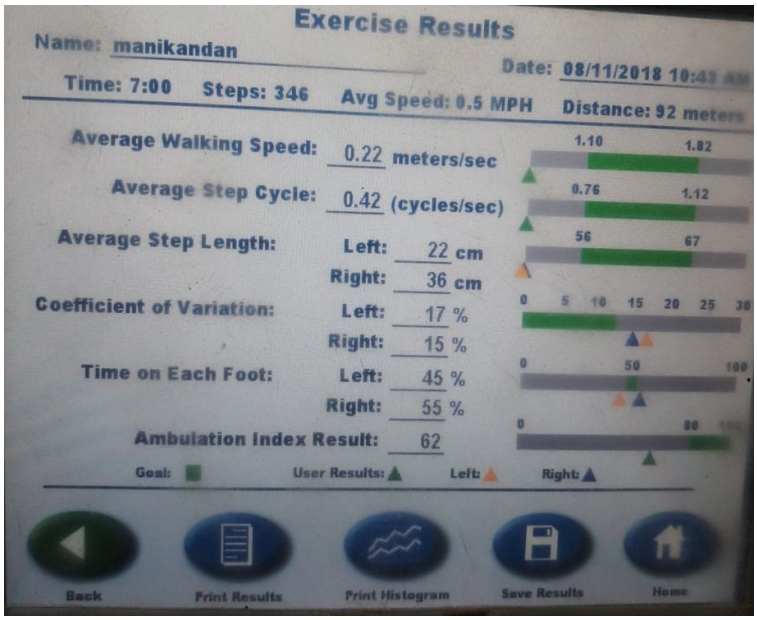


FIGURE 4.13.4 PATIENT ON TREADMILL TRAINING UNDER SUPERVISION OF PHYSIOTHERAPIST

Patients should be medically stable before starting an active program of physical therapy. Check the,

- Blood Pressure and Circulation
- Respiration
- Mental Capacity for Cognition and Behaviour
- Bowel / Bladder Control
- Patient Considerations,
- Breaks should be incorporated throughout the treatment session as needed.
- Always attach the safety lanyard to the patients clothing or wrist before starting the exercises
- If patient feels faint, dizzy, or short of breath means immediately discontinue the exercise.

TREADMILL TRAINING

Switch on the device and make the platform into flat position, and arrange the suspension frame in position.

Explain the procedure to the patient and demonstrate the gait over the gait trainer.

- Fasten the pelvic harness to the patient raise the patient by increasing the frame height.
- Adjust cross bar height with handle.(adjust length of safety strap as required)
- Adjust Harness Straps as needed and connect patient to across bar.
- Unweight the patient by turning handle, until stop indicator is centered .
- { Unweight the patient is depend upon the patient's body weight. Initial Body weight will be 30% to 40% and Maximum we can unweight the patient's body weight to till 70%
- { As the Treatment progressed, the body weight support was gradually decreased}
- Select the training mode in the monitor and enter the patient details in to it .
- Attach the emergency stop wire to the patient.
- Start the training.
- Set the Speed
- {By the 1st Day – the speed limit will be 0.5 mph (miles per hour) and by the 3rd week the speed limit will be 1.5 to 2 mph and then gradually increased depends upon the patients.}
- Assist the lower limbs, if the patient is weak to walk on the treadmill.
- Ask the patient to see the monitor to get the feedback about the gait.
- Instruct the patient to adjust the Step Length to get the good comment on the screen.
- After training save the data in the computer and take print out for document record.
- Switch off the device. Lower the patient and remove the harness and bring the patient to the chair.
- After discharge of the patients , home exercises was advised.

Infection Control:

- The Harness must be covered with towel to avoid contact with the patient.
- New towel is used for every single patient.

Caution:

- Do not leave patient unattended.
- Inspect ropes, cables, fittings, and harness before use.

2. Conventional Exercise:

- Along with the Body Weight Supported Treadmill Training, the above mentioned Conventional Exercise were given.

4.14 STATISTICAL TOOL

a) Independent‘t’ Test

b) Paired‘t’ Test

4.14.1 INDEPENDENT‘t’ TEST (between groups)

$$t = \frac{\overline{X1} - \overline{X2}}{S}\sqrt{\frac{n_1 n_2}{(n_1 + n_2)}} \qquad \text{Where, } S = \sqrt{\frac{\sum d_1^2 + \sum d_2^2}{n_1 + n_2 - 2}}$$

4.14.2 PAIRED‘t’ TEST (within groups)

$$\mathbf{t} = \frac{\bar{d}\sqrt{n}}{S} \qquad \text{Where, S} = \sqrt{\frac{\sum d^2 - \left[\bar{d}\right]^2 \times n}{n-1}}$$

S = Combined standard deviation

d_1 & d_2 = difference between initial and final readings in group A & B

n_1 & n_2= number of patients in group A & group B

X_1 & X_2 = mean of group A & group B

DATA PRESENTATION

5. DATA PRESENTATION

5.1 TABULAR PRESENTATION

5.1.1 DEMOGRAPHIC DATA OF THE STUDY POPULATION

Characteristics	Group A (Control group)		Group B (Experimental group)	
	Mean	SD	Mean	SD
Age	42.75	9.614	45.8	15.34
Sex	6-Male 2-Female	-	6-Male 2-Female	-
Artery	MCA	-	MCA	-
Type of Stroke	Ischaemic	-	Ischaemic	-

Table 5.1.1: Demographic Data

5.1.2 Paired 't' test values for variables of both Group A (control Group) and Group B (Experiment Group)

Outcome Measures	Group	Pre & post test	Mean±SD	Calculated 't'value	Table 't'value	Level of significance
Fugl meyer assessment-(FMA-LE)	Group-A	Pre-test	26.12±2.0	5.535	2.365	**P<0.05**
		Post-test	30.25±0.9			
	Group-B	Pre-test	24.25±1.8	6.977	2.365	**P<0.05**
		Post-test	28.62±0.6			
Berg Balance Scale (BBS)	Group-A	Pre-test	32.75±3.2	10.02	2.365	**P<0.05**
		Post-test	43.25±2.2			
	Group-B	Pre-test	34.12±1.6	11.31	2.365	**P<0.05**
		Post-test	44.62±2.1			
Functional ambulation category (FAC)	Group-A	Pre-test	2±0	0	2.365	P>0.05
		Post-test	3±0			
	Group-B	Pre-test	1.75±0.4	7.629	2.365	**P<0.05**
		Post-test	3±0			
Activities specific balance confidence scale (ABC)	Group-A	Pre-test	0.381±0.07	3.146	2.365	**P<0.05**
		Post-test	0.775±0.07			
	Group-B	Pre-test	0.356±0.03	12.08	2.365	**P<0.05**
		Post-test	0.668±0.08			
Step length	Group-A	Pre-test	0.426±0.17	2.677	2.365	**P<0.05**
		Post-test	0.683±0.13			
	Group-B	Pre-test	0.273±0.06	9.85	2.365	**P<0.05**
		Post-test	0.772±0.12			
Stride length	Group-A	Pre-test	0.567±0.04	5.458	2.365	**P<0.05**
		Post-test	0.987±0.12			
	Group-B	Pre-test	0.636±0.08	2.02	2.365	P>0.05
		Post-test	1.092±0.11			
Cadence	Group-A	Pre-test	55.75±7.4	32.6	2.365	**P<0.05**
		Post-test	94±8			
	Group-B	Pre-test	51.12±8.6			

		Post-test	32.62±9.6	13.42	2.365	**P<0.05**

(Paired 't' test values - [p > 0.05 = Not Significant; p <0.05 = Significant])

5.1.3 Independent 't' test values for variables of Both Groups

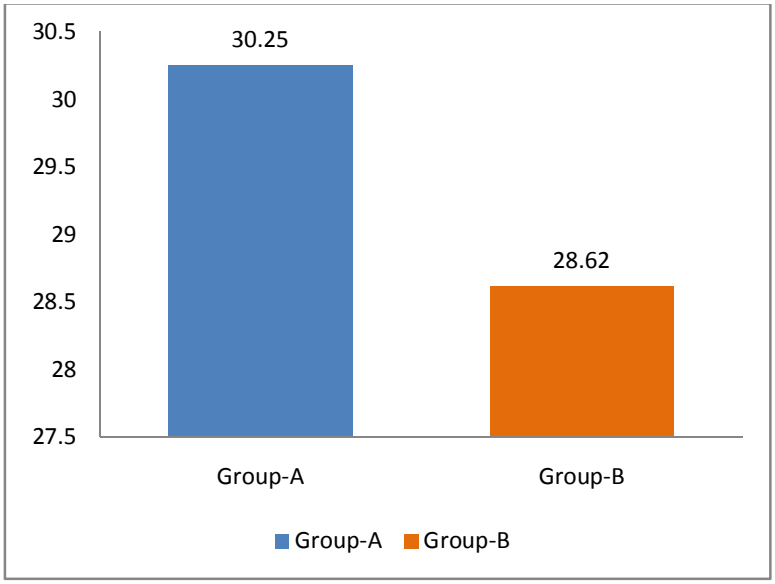
Outcome Measures	Group	Mean±SD	Calculated 't'value	Table 't'value	Level of significance
Fugl meyer assessment-(FMA-LE)	Group-A	30.25±0.97	3.6	2.145	**P<0.05**
	Group-B	28.62±0.7			
Berg balance scale (BBS)	Group-A	43.25±2.2	1.164	2.145	P>0.05
	Group-B	44.62±2.1			
Functional ambulation category (FAC)	Group-A	3±0	0	2.145	P>0.05
	Group-B	3±0			
Activities specific balance confidence scale (ABC)	Group-A	0.77±0.07	4.862	2.145	**P<0.05**
	Group-B	0.66±0.09			
Step length	Group-A	0.68±0.14	1.8	2.145	P>0.05
	Group-B	0.77±0.07			
Stride length	Group-A	0.98±0.12	1.604	2.145	P>0.05
	Group-B	1.09±0.11			
Cadence	Group-A	94±8	5.062	2.145	**P<0.05**
	Group-B	91±9.6			

Independent 't' test values – [p > 0.05 = Not Significant; p <0.05 = Significant])

5.2 GRAPHICAL REPRESENTATION

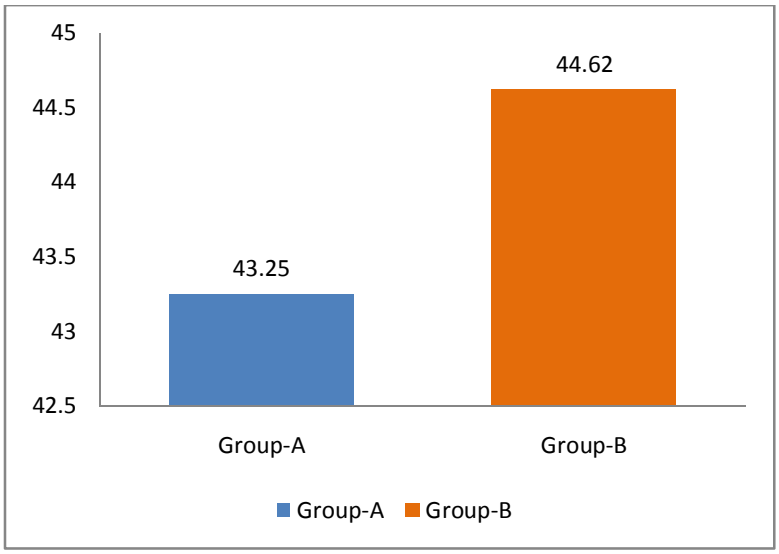
5.2.1 Fugl Meyer Assessment of Physical Performance (FMA-LE) Scores : Group A & Group B

Graph 5.2.1 : Mean Value Changes in Fugl Meyer Assessment of Physical Performance (FMA-LE) Scores For Both Group A (Experimental) And Group B (Control)



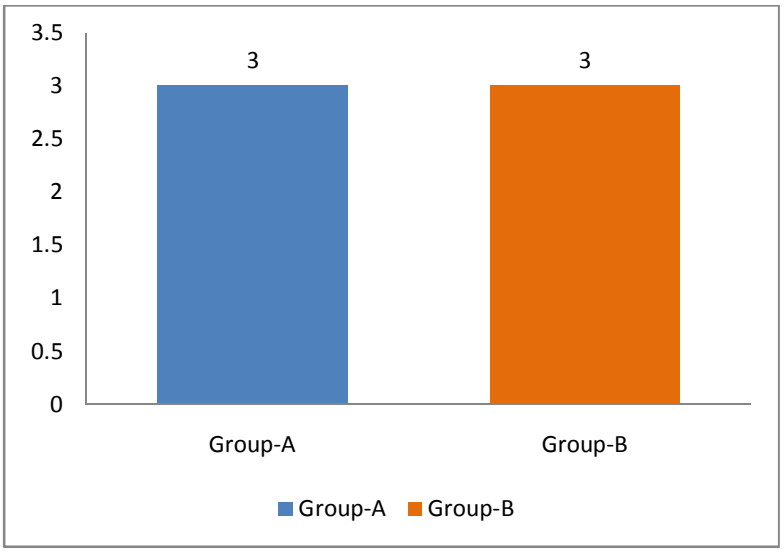
5.2.2. Berg Balance Scale (BBS) Scores : Group A & Group B

Graph 5.2.2 : Mean Value Changes in Berg Balance Scale (BBS) Scores For Both Group A (Experimental) And Group B (Control)



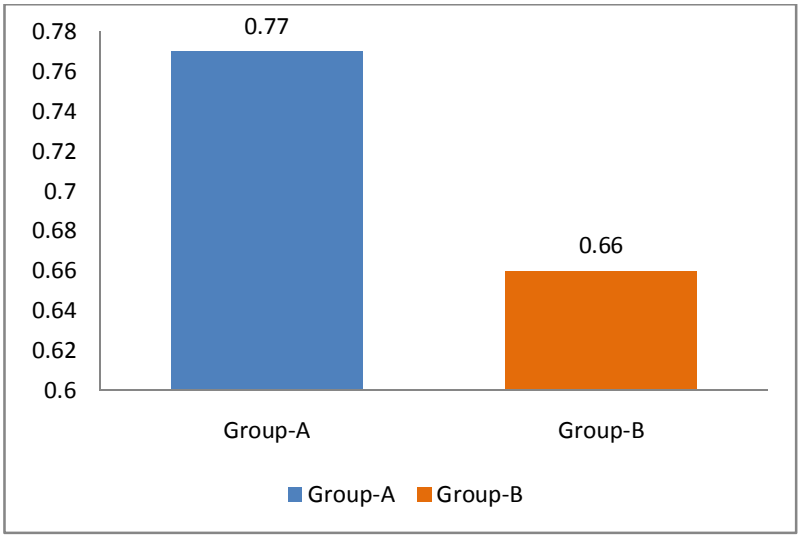
5.2.3. FUNCTIONAL AMBULATION CATEGORY SCORES : GROUP A & GROUP B

Graph 5.2.3 : Mean Value Changes in Functional Ambulation Category (FAC) Scores For Both Group A (Experimental) And Group B (Control)



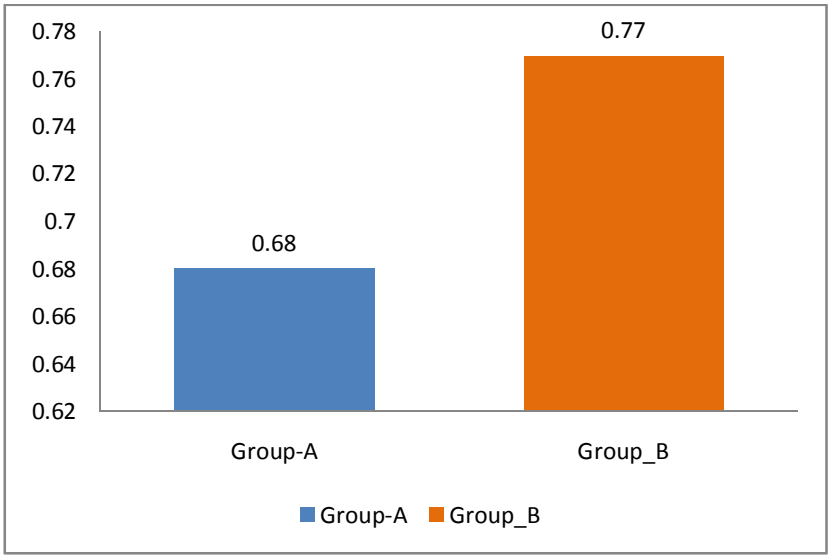
5.2.4. ACTIVITIES SPECIFIC BALANCE CONFIDENCE SCALE (ABC) SCORES : GROUP A & GROUP B

Graph 5.2.4 : Mean Value Changes in Activities Specific Balance Confidence Scale (ABC) Scores For Both Group A (Experimental) And Group B (Control)



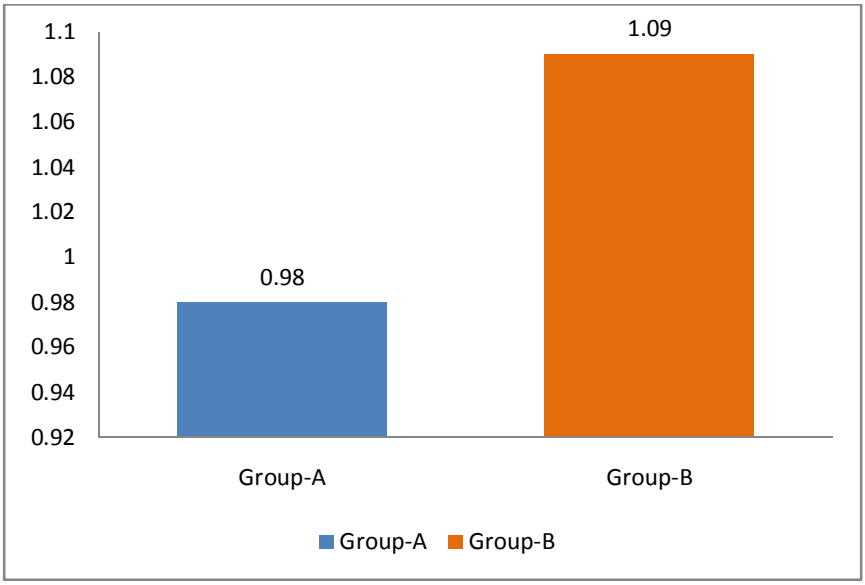
5.2.5. STEP LENGTH SCORES : GROUP A & GROUP B

Graph 5.2.5 : Mean Value Changes in Step Length Scores For Both Group A (Experimental) And Group B (Control)



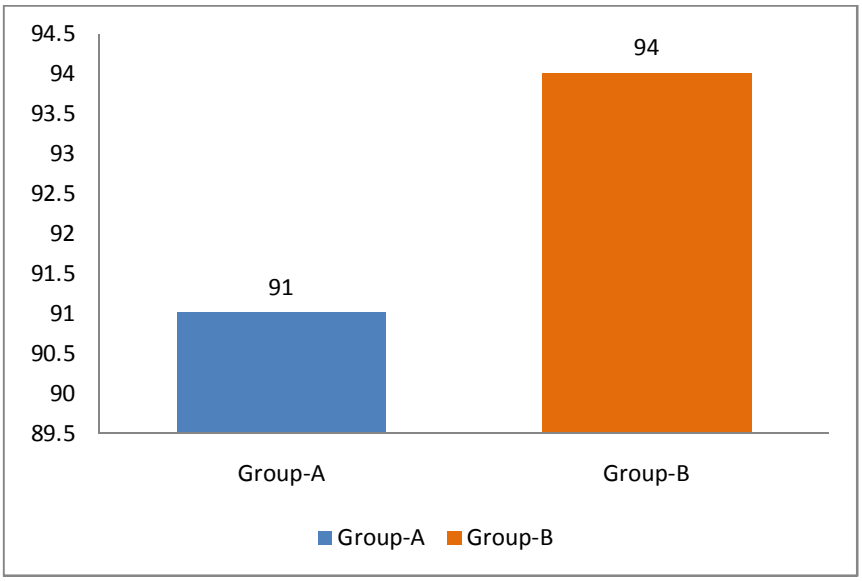
5.2.6. STRIDE LENGTH SCORES : GROUP A & GROUP B

Graph 5.2.6 : Mean Value Changes in Stride Length Scores For Both Group A (Experimental) And Group B (Control)



5.2.7. CADENCE SCORES : GROUP A & GROUP B

Graph 5.2.7 : Mean Value Changes in Cadence Scores For Both Group A (Experimental) And Group B (Control)


94.5
94
93.5
93
92.5
92
91.5
91
90.5
90
89.5
91
94
Group-A
Group-B
Group-A
Group-B

RESULTS AND ANALYSIS

6. RESULTS AND DATA ANALYSIS

(GROUP A – Control Group, GROUP B – Experimental Group)

6.1 INDEPENDENT 't' TEST

6.1.1 : Fugl Meyer Assessment of Physical Performance

For 14 degrees of freedom and at 5% level of significance, the table 't' value is 2.145 and the calculated 't value is 3.6. Since the calculated value is greater than the table 't' value . Null hypothesis is rejected and the alternate hypothesis is accepted. (H_0 - There is **a significant difference** exists between the Post test mean values of Fugl Meyer Assessment of Physical Performance Score between Group A and Group B).

6.1.2 : Berg Balance Scale

For 14 degrees of freedom and at 5% level of significance, the table 't' value is 2.145 and the calculated 't value is 1.164. Since the calculated value is less than the table 't' value. Null hypothesis is accepted and alternate hypothesis isrejected. (Ho – There is a **no significant difference** exists between the Post test mean values of Berg Balance Score between Group A and Group B).

6.1.3 : Functional Ambulation Category

For 14 degrees of freedom and at 5% level of significance, the table 't' value is 2.145 and the calculated 't value is 0. Since the calculated value is less than the table 't' value . Null hypothesis is accepted and the alternate hypothesis is rejected. (H_0 - There is **no significant difference** exists between the Pretest mean values of Functional Ambulation Category Score between Group A and Group B).

6.1.4 : Acitivites Specific Balance Confidence Scale

For 14 degrees of freedom and at 5% level of significance, the table 't' value is 2.145 and the calculated 't value is 4.862. Since the calculated value is greater than the table 't' value. Null hypothesis is rejected and the alternate hypothesis is accepted. (H_0 - There is **a significant difference** exists between the Post test mean values of Acitivity Specific Balance Confidence Scale Score between Group A and Group B).

6.1.5 : Step Length

For 14 degrees of freedom and at 5% level of significance, the table 't' value is 2.145 and the calculated 't value is 1.8. Since the calculated value is less than the table 't' value . Null hypothesis is accepted and the alternate hypothesis is rejected. (H_0 - There is **no significant difference** exists between the Post test mean values of step length Score between Group A and Group B).

6.1.6 : Stride Length

For 14 degrees of freedom and at 5% level of significance, the table 't' value is 2.145 and the calculated 't value is 1.604. Since the calculated value is less than the table 't' value. Null hypothesis is accepted and the alternate hypothesis is rejected. (H_0 - There is **no significant difference** exists between the Post test mean values of Stride length Score between Group A and Group B).

6.1.7 : Cadence

For 14 degrees of freedom and at 5% level of significance, the table 't' value is 2.145 and the calculated 't value is 5.062. Since the calculated value is greater than the table 't' value. Null hypothesis is rejected and alternate hypothesis is accepted. (Ho – There is **a significant difference** exists between the Post test mean values of cadence Score between Group A and Group B).

6.2 PAIRED 't' TEST

6.2.1 Fugl Meyer Assessment of Physical Performance

Group A

For 7 degrees of freedom and at 5% level of significance, the table 't' value is 2.365 and the calculated 't value is 5.535. Since the calculated value is greater than the table 't' value . Null hypothesis is rejected and the alternate hypothesis is acepted (H_0 - There is **a significant difference** exists between the Pretest and post test mean values of Fugl Meyer Assessment of Physical Performance Score)

Group B

For 7 degrees of freedom and at 5% level of significance, the table 't' value is 2.365 and the calculated 't value is 6.977. Since the calculated value is greater than the table 't' value . Null hypothesis is rejected and the alternate hypothesis is accepted (H_0 - There is **a**

significant difference exists between the Pretest and post test mean values of Fugl Meyer Assessment of Physical Performance Score)

6.2.2 Berg Balance Scale

Group A

For 7 degrees of freedom and at 5% level of significance, the table 't' value is 2.365 and the calculated 't value is 10.02. Since the calculated value is greater than the table 't' value . Null hypothesis is rejected and the alternate hypothesis is accepted (H_0 - There is **a significant difference** exists between the Pretest and posttest mean values of Berg Balance Score)

Group B

For 7 degrees of freedom and at 5% level of significance, the table 't' value is 2.365 and the calculated 't value is 11.31. Since the calculated value is greater than the table 't' value . Null hypothesis is rejected and the alternate hypothesis is accepted (H_0 - There is **a significant difference** exists between the Pretest and posttest mean values of Berg Balance Score)

6.2.3 Functional Ambulation Category

Group A

For 7 degrees of freedom and at 5% level of significance, the table 't' value is 2.365 and the calculated 't value is 0. Since the calculated value is less than the table 't' value . Null hypothesis is accepted and the alternate hypothesis is rejected (H_0 - There is **a no significant difference** exists between the Pretest and posttest mean values of Functional Ambulation Score)

Group B

For 7 degrees of freedom and at 5% level of significance, the table 't' value is 2.365 and the calculated 't value is 7.629. Since the calculated value is greater than the table 't' value . Null hypothesis is rejected and the alternate hypothesis is accepted (H_0 - There is **a significant difference** exists between the Pretest and posttest mean values of Functional Ambulation Score)

6.2.4 Acitivity Specific Balance Confidence Scale

Group A

For 7 degrees of freedom and at 5% level of significance, the table 't' value is 2.365 and the calculated 't value is 3.146. Since the calculated value is greater than the table 't' value . Null hypothesis is rejected and the alternate hypothesis is accepted (H_0 - There is **a significant difference** exists between the Pretest and post test mean values of Acitivity Specific Balance Confidence Scale Score)

Group B

For 7 degrees of freedom and at 5% level of significance, the table 't' value is 2.365 and the calculated 't value is 12.08. Since the calculated value is greater than the table 't' value . Null hypothesis is rejected and the alternate hypothesis is accepted (H_0 - There is **a significant difference** exists between the Pretest and post test mean values of Acitivity Specific Balance Confidence Scale Score)

6.2.5 Step Length

Group A

For 7 degrees of freedom and at 5% level of significance, the table 't' value is 2.365 and the calculated 't value is 2.677. Since the calculated value is greater than the table 't' value . Null hypothesis is rejected and the alternate hypothesis is accepted (H_0 - There is **a significant difference** exists between the Pretest and post test mean step length Score)

Group B

For 7 degrees of freedom and at 5% level of significance, the table 't' value is 2.365 and the calculated 't value is 9.85. Since the calculated value is greater than the table 't' value . Null hypothesis is rejected and the alternate hypothesis is accepted (H_0 - There is **a significant difference** exists between the Pretest and post test mean value of step length)

6.2.6 Stride Length

Group A

For 7 degrees of freedom and at 5% level of significance, the table 't' value is 2.365 and the calculated 't value is 5.458. Since the calculated value is greater than the table 't' value . Null hypothesis is rejected and the alternate hypothesis is accepted (H_0 - There is **a significant difference** exists between the Pretest and post test mean value of stride length)

Group B

For 7 degrees of freedom and at 5% level of significance, the table ‘t’ value is 2.365 and the calculated ‘t value is 2.02. Since the calculated value is less than the table ‘t’ value . Null hypothesis is accepted and the alternate hypothesis is rejected (H_0 - There is **no significant difference** exists between the Pretest and posttest mean values of Stride Length)

6.2.7 cadence

Group A

For 7 degrees of freedom and at 5% level of significance, the table ‘t’ value is 2.365 and the calculated ‘t value is 32.6. Since the calculated value is greater than the table ‘t’ value . Null hypothesis is rejected and the alternate hypothesis is accepted (H_0 - There is **a significant difference** exists between the Pretest and post test mean value of cadence)

Group B

For 7 degrees of freedom and at 5% level of significance, the table ‘t’ value is 2.365 and the calculated ‘t value is 13.42. Since the calculated value is greater than the table ‘t’ value . Null hypothesis is rejected and the alternate hypothesis is accepted (H_0 - There is **a significant difference** exists between the Pretest and post test mean value of cadence)

DISCUSSION

7. DISCUSSION

Stroke is a disabling condition which requires immediate medical response as well as rehabilitation. Rehabilitation initiated as early as possible is found to be more effective[1] The improvements are seen maximum within the first 30 days which tapers off over 6 months. Gait training initiated as early as possible will help the patient attain a significant functional improvement in standing as well as for ambulation[5]

Currenly, Gait Rehabilitation of the Acute stroke patients are based on task – specific guidelines, with the patients practicing on the treadmill for increasing the repetition. Patients in both groups showed changes in their gait performance and also on other motor functions considerably during the study period. This study is consistent with finding from similar studies[4]

In this study, Treadmill Training began early with routine rehabilitation. It had been demonstrated that earlier gait recovery after stroke is associated with further gait independence and that , the task specific interventions are applied early and intensively may be the most effective

In this Study, sensorimotor recovery was assessed by using- the Fugl – Meyer sensorimotor Assessment of Physical Performance (FMA-LE). This study showed that there was significant difference exists between the Post test mean values of Group A(Control Group) and Group B(Experiment Group).

Panmela et.al., discussed that Changes in the scores on the Fugl – Meyer Assessment of Motor recovery in the Legs were modest. Participant with initially moderate impairment and those with initially severe impairment also had improvement in their study. The results of this study is also consistent with published studies that have used Body Weight Supported Treadmill Training early intervention to improve the Balance and lower extremity motor functions in patients with acute stroke[6]

In this Study, Balance was assessed by using Berg Balance Scale. This study showed that "There was no statistical significant difference between the post test mean values of Group A(Control Group) and Group B(Experiment Group).

Karen et al., discussed that, at the time of discharge, based on the observational gait analysis, the subject walked with a consistent step- through pattern as well as comparable step length and stance time bilaterally. Over all there is a improvement in Berg Balance Scale[4]

The Body Weight Supported Treadmill Training after acute stroke, Ambulation was assessed by using Functional Ambulation Category. This study showed that there is no significant difference exists between the Post test mean values of Group A(Control Group) and Group B(Experiment Group).

C.Werner et al., discussed that, the improvement of Gait ability (median FAC gain from 1 to 4 in group A and from 1 to 3 in group B) during the 6-week intervention period were compared with the results of other groups studying treadmill training. Overall there is a improvement in Functional Ambulation Category[19]

In this study, confidence level was assessed by using Activity Specific Balance Confidence Scale. This study showed that there was significant difference exists between the Post test mean values of Group A(Control Group) and Group B(Experiment Group).

In this Study, the Gait Parameters (Step Length, Stride Length, Cadence) showed that there is a significant changed in both the groups. There was a practical difficulty in assessing the walking speed during the early phase of stroke.

Yu-Rang Mao et al., discussed that there is a improvement in temporal spatial parameters (increased cadence, stride length, and step length) is achievable. Results of this indicates that patients with sub acute stroke could improve gait velocity just after 3 weeks of BWSTT (Improvement in gait speed is a result of increased stride length, step length and cadence)[20]

The Results of this study showed that, treadmill training with body weight support are not more likely to improve their ability to walk independently compared with people after stroke not receiving treadmill training. But Motor Function, Confidence level and spatiotemporal parameters (Cadence) is improved with 3 weeks of Treadmill Training.

This study have got lack of significant difference. It could be due to the small sample size which lacks the power to detect small difference or the short three week intervention period which was not sufficient long to produce further changes.

So, this study suggested that improvements in motor function, balance & gait achieved during Body Weight Supported Treadmill Training can be continued and trains to full weight over ground walking after a training procedure. Ultimately this will be more useful to increase the confidence level and better balance and gait. One of the major use of Body Weight supported Treadmill Training (BWSTT) is to provide the 'Task Specific Gait Training' during the early days of rehabilitation as needed by the patients.

SUMMARY AND CONCLUSION

8. SUMMARY AND CONCLUSION

The result of this study indicates that addition of Body Weight Supported Treadmill Training (BWSTT) is a feasible and safe technique to perform gait training in Acute Stroke Rehabilitation and to help in recovery of the Motor Function, Confidence level and cadence among Acute Middle Cerebral Artery stroke patients.

LIMITATIONS AND SUGGESTIONS

9. LIMITATIONS & SUGGESTIONS

9.1 LIMITATIONS

- As only small sample size is included in this study, the results cannot be generalized.
- As many patients get discharged during the early stage of rehabilitation, there was difficulty in conducting the study.
- Adherence of patients to regular Body Weight Supported Treadmill Training had practical difficulty.

9.2 SUGGESTIONS

- Follow-up studies can be done to analyze the sustenance of effects.
- A future study with greater sample size is recommended
- Other factors which influence the Specific gait parameters of patients can also be analyzed in future research.
- This study can be extended to the population of stroke patients in whom other territories are involved.
- Further research should specifically investigate the effects of different frequencies, durations or intensities of treadmill training, as well as the use of handrails, in ambulatory patients, but not in dependent walkers.
- Observational Gait Analysis with Video recording or Quantifiable gait analysis can also be analyzed in future study
- In future studies, they can have baseline measurements like number of steps/repetition, Intensity of lower limb training and dosage.

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APPENDIX

APPENDIX -I

ETHICAL CLEARENCE

KMCH ETHICS COMMITTEE
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EC Reg. No : ECR / 112 / Inst / TN / 2013

Ref: EC/AP/642/10/2018
09.10.2018

APPROVED

To

Prof. A. Brammatha. MPT (Neuro),
KMCH college of Physiotherapy,
Coimbatore – 641 014

Dear Prof. A. Brammatha,

The proposal entitled **"The effect of Body Weight Supported Treadmill Trainning on Sensorimotor Function, Balance and Gait among Patients with Acute middle Cerebral Artery Stroke"**, submitted by **Ms. P. Nandhini,** under your supervision was reviewed by the Ethics Committee in its meeting held on **06.10.2018** and grants ethical clearance for the study.

Regards,
Yours Sincerely,

11/10/18

Dr.M.S. Thamizharasi,
Chairperson,
KMCH Ethics Committee

Dr. M.S.Thamizharasi
M.D.,D.G.O.,PG Dip (Psych)
Chairperson
Ethics Committee
Kovai Medical Center and Hospital
Coimbatore - 641 014

Copy to Clinical Guide:
Dr. Edmund. M. D'couto, MBBS, MD (PMR),
Consultant – Head of the department of Physical Medicine and Rehabilitation,
Principal,
KMCH college of Physiotherapy,
Coimbatore – 641 014

ETHICS COMMITTEE

APPENDIX – II

INFORMED CONSENT FORM

I _____ , consent the researcher for my voluntary participation in the study, " **THE EFFECT OF BODY WEIGHT SUPPORTED TREADMILL TRAINING (BWSTT) ON SENSORIMOTOR FUNCTION, BALANCE AND GAIT AMONG PATIENTS WITH ACUTE MIDDLE CEREBRAL ARTERY STROKE".**The Researcher has explained me about the treatment approach in brief and the risk of participation and has answered the questions related to the research to my satisfaction.

SIGNATURE OF PARTICIPANT :

SIGNATURE OF RESEARCHER :

SIGNATURE OF WITNESS :

APPENDIX III

DATA PERFORMA

Name :

Age/Sex :

RegNo :

D.O.Adm :

D.O.Ass :

Pathology : Isch/hem

Affected Side : R/L

Outcome Measure's:

Scale's	Pre Test	Post Test
MMSE		
Fugl Meyer (LL)		
Berg Balance Scale		
Functional Ambulation Category (FAC)		
Activity Specific Balance Confidence Scale(ABC)		
Gait : Step Length		
Stride Length		
Cadence		

Group : Duration of Treatment :

Intervention : Date :

APPENDIX IV

FUGL – MEYER ASSESSMENT OF PHYSICAL PERFORMANCE

Scoring: **0 = no motion** **1 = partial motion** **2 = full motion**

			Affected	*Unaffected*
Test 1	***Reflex activity (can reflexes be elicited or not?)***: supine			
	1. patellar	0=no reflex activity	0 2	0 2
	2. Achilles	2=reflex activity elicited	0 2	0 2
Test 2	***Dynamic movement within flexor synergy***: supine			
	3. hip flexion		0 1 2	0 1 2
	4. knee flexion		0 1 2	0 1 2
	5. ankle dorsiflexion		0 1 2	0 1 2
	Dynamic movement within extensor synergy: sidelying			
	6. hip extension		0 1 2	0 1 2
	7. hip abduction		0 1 2	0 1 2
	8. knee extension		0 1 2	0 1 2
	9. ankle plantarflexion		0 1 2	0 1 2
Test 3	***Active movement while sitting***:			
	10. flex knee to and past 90°		0 1 2	0 1 2
	11. ankle dorsiflexion		0 1 2	0 1 2
	actively flexed to about 90°			
Test 4	***Active movementwhile standing:***			
	12. flex knee to 90° with hip at 0		0 1 2	0 1 2
	13. dorsiflex ankle		0 1 2	0 1 2
Test 5	***Normal reflex activity:*** seated			
	14. scored as being hyperactive or not Testing at knee flexors, patellar, and Achilles		0 1 2	0 1 2
Test 6	***Coordination/speed:*** supine			
	15. tremor		0 1 2	0 1 2
	16. dysmetria		0 1 2	0 1 2
	17. speed		0 1 2	0 1 2
		TOTAL	_____	_____

APPENDIX V

BERG BALANCE SCALE

General Instructions:

Please document each task and/or give instructions as written. When scoring, please record the lowest response category that applies for each item.

In most items, the subject is asked to maintain a given position for a specific time. Progressively more points are deducted if:

- the time or distance requirements are not met
- the subject's performance warrants supervision
- the subject touches an external support or receives assistance from the examiner

Subject should understand that they must maintain their balance while attempting the tasks. The choices of which leg to stand on or how far to reach are left to the subject. Poor judgment will adversely influence the performance and the scoring.

Equipment required for testing is a stopwatch or watch with a second hand, and a ruler or other indicator of 2, 5, and 10 inches. Chairs used during testing should be a reasonable height. Either a step or a stool of average step height may be used for item # 12.

_____ 1. SITTING TO STANDING

Instructions: Please stand up. Try not to use your hand for support.

(4) - Able to stand without using hands and stabilize independently
(3) - Able to stand independently using hands
(2) - Able to stand using hands after several tries
(1) - Needs minimal aid to stand or stabilize
(0) - Needs moderate or maximal assist to stand

_____ 2. STANDING UNSUPPORTED

Instructions: Please stand for two minutes without holding on.

(4) - Able to stand safely for 2 minutes
(3) - Able to stand 2 minutes with supervision
(2) - Able to stand 30 seconds unsupported
(1) - Needs several tries to stand 30 seconds unsupported
(0) - Unable to stand 30 seconds unsupported

If a subject is able to stand 2 minutes unsupported, score full points for sitting unsupported. Proceed to item #4.

_____ 3. SITTING WITH BACK UNSUPPORTED BUT FEET SUPPORTED ON FLOOR OR ON A STOOL

Instructions: Please sit with arms folded for 2 minutes.

(4) - Able to sit safely and securely for 2 minutes
(3) - Able to sit 2 minutes under supervision
(2) - Able to able to sit 30 seconds
(1) - Able to sit 10 seconds

(0) - Unable to sit without support 10 seconds

_____ 4. STANDING TO SITTING

Instructions: Please sit down.

(4) - Sits safely with minimal use of hands
(3) - Controls descent by using hands
(2) - Uses back of legs against chair to control descent
(1) - Sits independently but has uncontrolled descent
(0) - Needs assist to sit

_____ 5. TRANSFERS

Instructions: Arrange chair(s) for pivot transfer. Ask subject to transfer one way toward a seat with armrests and one way toward a seat without armrests. You may use two chairs (one with and one without armrests) or a bed and a chair.

(4) - Able to transfer safely with minor use of hands
(3) - Able to transfer safely definite need of hands
(2) - Able to transfer with verbal cuing and/or supervision
(1) - Needs one person to assist
(0) - Needs two people to assist or supervise to be safe

_____ 6. STANDING UNSUPPORTED WITH EYES CLOSED

Instructions: Please close your eyes and stand still for 10 seconds.

(4) - Able to stand 10 seconds safely
(3) - Able to stand 10 seconds with supervision
(2) - Able to stand 3 seconds
(1) - Unable to keep eyes closed 3 seconds but stays safely
(0) - Needs help to keep from falling

_____ 7. STANDING UNSUPPORTED WITH FEET TOGETHER

Instructions: Place your feet together and stand without holding on.

(4) - Able to place feet together independently and stand 1 minute safely
(3) - Able to place feet together independently and stand 1 minute with supervision
(2) - Able to place feet together independently but unable to hold for 30 seconds
(1) - Needs help to attain position but able to stand 15 seconds feet together
(0) - Needs help to attain position and unable to hold for 15 seconds

_____ 8. REACHING FORWARD WITH OUTSTRETCHED ARM WHILE STANDING

Instructions: Lift arm to 90 degrees. Stretch out your fingers and reach forward as far as you can. (Examiner places a ruler at the end of fingertips when arm is at 90 degrees. Fingers should not touch the ruler while reaching forward. The recorded measure is the distance forward that the fingers reach while the subject is in the most forward lean position. When possible, ask subject to use both arms when reaching to avoid rotation of the trunk.)

(4) - Can reach forward confidently 25 cm (10 inches)
(3) - Can reach forward 12 cm (5 inches)
(2) - Can reach forward 5 cm (2 inches)
(1) - Reaches forward but needs supervision
(0) - Loses balance while trying/requires external support

_____ 9. PICK UP OBJECT FROM THE FLOOR FROM A STANDING POSITION

Instructions: Pick up the shoe/slipper, which is place in front of your feet.

(4) - Able to pick up slipper safely and easily
(3) - Able to pick up slipper but needs supervision
(2) - Unable to pick up but reaches 2-5 cm (1-2 inches) from slipper and keeps balance independently
(1) - Unable to pick up and needs supervision while trying
(0) - Unable to try/needs assist to keep from losing balance or falling

_____ 10. TURNING TO LOOK BEHIND OVER LEFT AND RIGHT SHOULDERS WHILE STANDING

Instructions: Turn to look directly behind you over toward the left shoulder. Repeat to the right. Examiner may pick an object to look at directly behind the subject to encourage a better twist turn.

(4) - Looks behind from both sides and weight shifts well
(3) - Looks behind one side only other side shows less weight shift
(2) - Turns sideways only but maintains balance
(1) - Needs supervision when turning
(0) - Needs assist to keep from losing balance or falling

_____ 11. TURN 360 DEGREES

Instructions: Turn completely around in a full circle. Pause. Then turn a full circle in the other direction.

(4) - Able to turn 360 degrees safely in 4 seconds or less
(3) - Able to turn 360 degrees safely one side only 4 seconds or less
(2) - Able to turn 360 degrees safely but slowly
(1) - Needs close supervision or verbal cuing
(0) - Needs assistance while turning

_____ 12. PLACE ALTERNATE FOOT ON STEP OR STOOL WHILE STANDING UNSUPPORTED

Instructions: Place each foot alternately on the step/stool. Continue until each foot has touched the step/stool four times.

(4) - Able to stand independently and safely and complete 8 steps in 20 seconds
(3) - Able to stand independently and complete 8 steps in > 20 seconds
(2) - Able to complete 4 steps without aid with supervision
(1) - Able to complete > 2 steps needs minimal assist
(0) - Needs assistance to keep from falling/unable to try

_____ 13. STANDING UNSUPPORTED ONE FOOT IN FRONT

Instructions: (DEMONSTRATE TO SUBJECT) Place one foot directly in front of the other. If you feel that you cannot place your foot directly in front, try to step far enough ahead that the heel of your forward foot is ahead of the toes of the other foot. (To score 3 points, the length of the step should exceed the length of the other foot and the width of the stance should approximate the subject's normal stride width.)

(4) - Able to place foot tandem independently and hold 30 seconds
(3) - Able to place foot ahead independently and hold 30 seconds
(2) - Able to take small step independently and hold 30 seconds
(1) - Needs help to step but can hold 15 seconds
(0) - Loses balance while stepping or standing

_____ 14. STANDING ON ONE LEG

Instructions: Stand on one leg as long as you can without holding on.

(4) - Able to lift leg independently and hold > 10 seconds

(3) - Able to lift leg independently and hold 5-10 seconds

(2) - Able to lift leg independently and hold ≥ 3 seconds

(1) - Tries to lift leg unable to hold 3 seconds but remains standing independently.

(0) - Unable to try of needs assist to prevent fall

Maximum Score = 56

APPENDIX IV

FUNCTIONAL AMBULATION CATEGORY

Category	Definition
0 Nonfunctional Ambulation	Subject cannot ambulate, ambulates in parallel bars only, or requires supervision or physical assistance from more than one person to ambulate safely outside of parallel bars.
1 Ambulator-Dependent for Physical Assistance Level II	Subject requires manual contacts of no more than one person during ambulation on level surfaces to prevent falling. Manual contacts are continuous and necessary to support body weight as well as maintain balance and/or assist coordination.
2 Ambulator-Dependent for Physical Assistance Level I	Subject requires manual contact of no more than one person during ambulation on level surfaces to prevent falling. Manual contact consists of continuous or intermittent light touch to assist balance or coordination.
3 Ambulator-Dependent for Supervision	Subject can physically ambulate on level surfaces without manual contact of another person but for safety requires standby guarding on no more than one person because of poor judgment, questionable cardiac status, or the need for verbal cuing to complete the task.
4 Ambulator-Independent Level Surfaces only	Subject can ambulate independently on level surfaces but requires supervision or physical assistance to negotiate any of the following: stairs, inclines, or nonlevel surfaces.
5 Ambulator-Independent	Subject can ambulate independently on nonlevel and level surfaces, stairs, and inclines

APPENDIX V

ACTIVITIES SPECIFIC BALANCE CONFIDENCE SCALE

Instructions: For each of the following, please indicate your level of confidence in doing the activity without losing your balance or becoming unsteady from choosing one of the percentage points on the scale form 0% to 100%. If you do not currently do the activity in question, try and imagine how confident you would be if you had to do the activity. If you normally use a walking aid to do the activity or hold onto someone, rate your confidence as it you were using these supports.

For each of the following activities, please indicate your level of self-confidence by choosing a corresponding number from the following rating scale:

"How confident are you that you will not lose your balance or become unsteady when you…

no confidence	0%	10	20	30	40	50	60	70	80	90	100% **completely confident**

1. …walk around the house? ____%

2. …walk up or down stairs? ____%

3. …bend over and pick up a slipper from the front of a closet floor ____%

4. …reach for a small can off a shelf at eye level? ____%

5. …stand on your tiptoes and reach for something above your head? ____%

6. …stand on a chair and reach for something? ____%

7. …sweep the floor? ____%

8. …walk outside the house to a car parked in the driveway? ____%

9. …get into or out of a car? ____%

10. …walk across a parking lot to the mall? ____%

11. …walk up or down a ramp? ____%

12. …walk in a crowded mall where people rapidly walk past you? ____%

13. …are bumped into by people as you walk through the mall?____%

14. … step onto or off an escalator while you are holding onto a railing?____%

15. … step onto or off an escalator while holding onto parcels such that you cannot hold onto the railing? ____%

16. …walk outside on icy sidewalks? ____%